



# Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 07:16 pm BST

PDB ID : 1KZQ  
Title : crystal structure of a parasite protein  
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Deposited on : 2002-02-07  
Resolution : 1.70 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

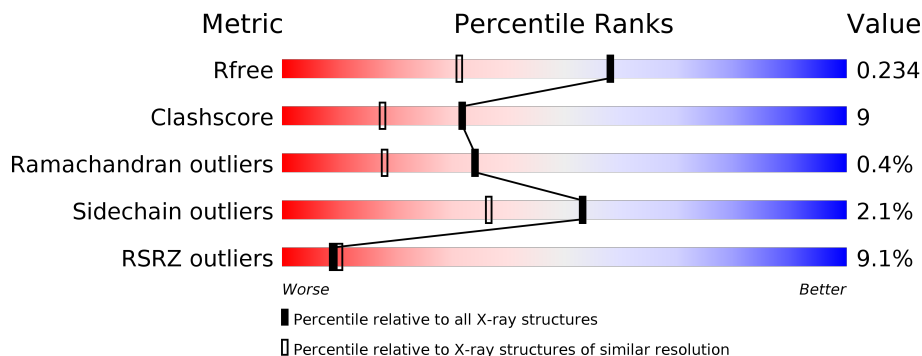
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	289	 9% 76% 10% • 12%
1	B	289	 7% 74% 11% • 12%

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 4375 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Major Surface Antigen P30.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	253	1851	1153	309	375	14	0	0	0
1	B	253	1851	1153	309	375	14	0	0	0

- Molecule 2 is water.

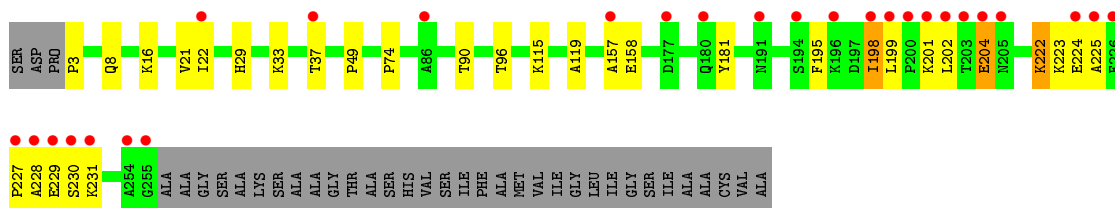
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	317	317	317	0	0
2	B	356	356	356	0	0

### 3 Residue-property plots [i](#)


These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

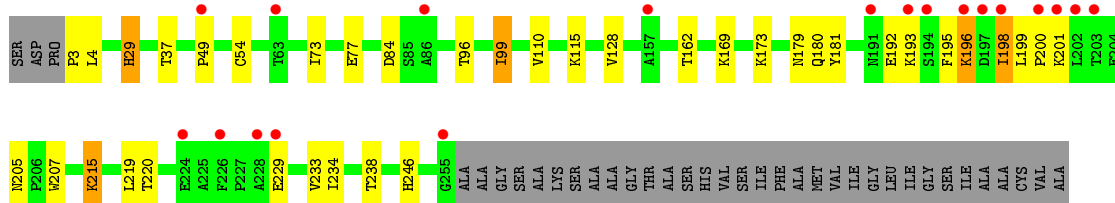
- Molecule 1: Major Surface Antigen P30

Chain A: 



- Molecule 1: Major Surface Antigen P30

Chain B: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	101.84Å 101.84Å 125.50Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.70 53.42 – 1.70	Depositor EDS
% Data completeness (in resolution range)	99.6 (50.00-1.70) 99.4 (53.42-1.70)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.99 (at 1.70Å)	Xtrriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.200 , 0.226 0.207 , 0.234	Depositor DCC
$R_{free}$ test set	3660 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	21.1	Xtrriage
Anisotropy	0.053	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 58.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	4375	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.27% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.37	0/1886	0.69	0/2573
1	B	0.36	0/1886	0.71	0/2573
All	All	0.37	0/3772	0.70	0/5146

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1851	0	1847	31	0
1	B	1851	0	1847	35	0
2	A	317	0	0	3	0
2	B	356	0	0	11	0
All	All	4375	0	3694	66	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 9.

All (66) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:198:ILE:HD13	1:B:198:ILE:H	1.44	0.81

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:215:LYS:HD3	2:B:350:HOH:O	1.82	0.79
1:A:222:LYS:HB3	1:A:225:ALA:HB2	1.65	0.79
1:A:222:LYS:HG2	1:A:224:GLU:H	1.54	0.71
1:A:198:ILE:HD13	1:A:198:ILE:H	1.61	0.66
1:B:196:LYS:HE2	1:B:196:LYS:H	1.64	0.63
1:A:199:LEU:CD2	1:A:227:PRO:HD3	2.29	0.62
1:B:169:LYS:HG3	2:B:412:HOH:O	2.01	0.60
1:A:74:PRO:HG2	2:A:339:HOH:O	2.00	0.60
1:B:99:ILE:O	1:B:99:ILE:HD13	2.02	0.58
1:A:222:LYS:HB3	1:A:225:ALA:CB	2.32	0.58
1:A:195:PHE:HB3	1:A:202:LEU:HD23	1.87	0.56
1:A:16:LYS:HE2	1:A:119:ALA:O	2.07	0.55
1:B:238:THR:HG22	1:B:246:HIS:CD2	2.41	0.55
1:A:195:PHE:O	1:A:198:ILE:HD13	2.06	0.55
1:A:199:LEU:HD12	1:A:202:LEU:HD22	1.89	0.54
1:A:22:ILE:HD12	2:B:428:HOH:O	2.08	0.53
1:B:181:TYR:OH	1:B:193:LYS:HD2	2.09	0.51
1:B:198:ILE:HG12	1:B:199:LEU:HG	1.92	0.51
1:A:181:TYR:CE2	1:A:198:ILE:HD12	2.46	0.51
1:A:229:GLU:O	1:A:231:LYS:HD3	2.12	0.50
1:A:33:LYS:HE2	1:A:90:THR:O	2.11	0.49
1:B:99:ILE:C	1:B:99:ILE:HD13	2.33	0.49
1:A:8:GLN:NE2	1:A:21:VAL:HG13	2.28	0.49
1:B:169:LYS:HG2	2:B:592:HOH:O	2.11	0.49
1:B:181:TYR:HB2	1:B:233:VAL:HG13	1.95	0.48
1:B:29:HIS:CE1	1:B:96:THR:HG23	2.49	0.48
1:B:198:ILE:HD13	1:B:198:ILE:N	2.20	0.48
1:A:228:ALA:HB3	1:A:229:GLU:OE1	2.13	0.48
1:B:162:THR:HG22	1:B:220:THR:HG23	1.95	0.48
1:A:201:LYS:HD3	1:A:201:LYS:C	2.35	0.47
1:B:173:LYS:NZ	1:B:207:TRP:CE2	2.79	0.47
1:B:77:GLU:HG2	2:B:595:HOH:O	2.14	0.47
1:B:84:ASP:HB2	2:B:605:HOH:O	2.14	0.47
1:A:198:ILE:HB	1:A:231:LYS:HG2	1.97	0.47
1:B:181:TYR:CD1	1:B:233:VAL:HG22	2.50	0.47
1:A:201:LYS:O	1:A:225:ALA:HB1	2.15	0.46
1:A:3:PRO:HB2	2:B:355:HOH:O	2.15	0.46
1:B:29:HIS:HE1	2:B:445:HOH:O	1.98	0.46
1:A:198:ILE:HG12	1:A:199:LEU:HG	1.97	0.46
1:B:238:THR:HG21	2:B:641:HOH:O	2.15	0.46
1:A:29:HIS:HD2	1:A:96:THR:OG1	1.99	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:198:ILE:C	1:B:200:PRO:HD3	2.35	0.46
1:A:230:SER:O	1:A:231:LYS:HD2	2.16	0.45
1:B:195:PHE:O	1:B:198:ILE:HD13	2.16	0.45
1:B:199:LEU:N	1:B:200:PRO:HD3	2.32	0.45
1:B:179:ASN:OD1	1:B:205:ASN:HB3	2.17	0.45
1:B:229:GLU:OE1	1:B:229:GLU:HA	2.17	0.44
1:B:180:GLN:OE1	1:B:192:GLU:HB3	2.18	0.43
1:A:37:THR:OG1	1:A:115:LYS:HE3	2.18	0.43
1:B:198:ILE:CD1	1:B:198:ILE:H	2.25	0.43
1:B:201:LYS:HG3	1:B:201:LYS:O	2.18	0.42
1:B:215:LYS:N	1:B:215:LYS:HD2	2.34	0.42
1:B:54:CYS:HB2	1:B:110:VAL:O	2.19	0.42
1:A:198:ILE:HD13	1:A:198:ILE:N	2.33	0.42
1:A:201:LYS:NZ	1:A:222:LYS:HE2	2.34	0.42
1:A:158:GLU:HB2	2:A:573:HOH:O	2.18	0.42
1:A:204:GLU:CD	1:A:204:GLU:H	2.23	0.42
1:B:207:TRP:CZ2	1:B:219:LEU:HD12	2.55	0.41
1:B:233:VAL:CG1	1:B:234:ILE:N	2.82	0.41
1:A:29:HIS:HE1	2:A:462:HOH:O	2.02	0.41
1:A:22:ILE:CD1	2:B:428:HOH:O	2.68	0.41
1:B:73:ILE:HD11	1:B:128:VAL:HG21	2.04	0.40
1:A:157:ALA:HB1	1:A:223:LYS:O	2.22	0.40
1:B:3:PRO:HB2	2:B:406:HOH:O	2.20	0.40
1:B:37:THR:OG1	1:B:115:LYS:HE3	2.22	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	251/289 (87%)	240 (96%)	9 (4%)	2 (1%)	<b>19</b>   <b>6</b>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	251/289 (87%)	242 (96%)	9 (4%)	0	100	100
All	All	502/578 (87%)	482 (96%)	18 (4%)	2 (0%)	34	18

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	204	GLU
1	A	222	LYS

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	214/236 (91%)	212 (99%)	2 (1%)	78	70
1	B	214/236 (91%)	207 (97%)	7 (3%)	38	19
All	All	428/472 (91%)	419 (98%)	9 (2%)	53	36

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	49	PRO
1	A	198	ILE
1	B	4	LEU
1	B	29	HIS
1	B	49	PRO
1	B	99	ILE
1	B	196	LYS
1	B	198	ILE
1	B	215	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	29	HIS
1	B	107	GLN
1	B	246	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

### 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

### 5.7 Other polymers [i](#)

There are no such residues in this entry.

### 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	253/289 (87%)	0.58	27 (10%) <b>6</b> <b>7</b>	13, 23, 68, 93	0
1	B	253/289 (87%)	0.37	19 (7%) <b>14</b> <b>16</b>	12, 23, 57, 80	0
All	All	506/578 (87%)	0.48	46 (9%) <b>9</b> <b>10</b>	12, 24, 61, 93	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	203	THR	7.6
1	A	202	LEU	6.3
1	A	201	LYS	5.9
1	A	229	GLU	5.2
1	A	204	GLU	5.0
1	B	228	ALA	5.0
1	A	200	PRO	4.6
1	A	205	ASN	4.4
1	B	203	THR	4.2
1	B	193	LYS	4.1
1	B	196	LYS	3.8
1	B	201	LYS	3.7
1	B	224	GLU	3.7
1	A	198	ILE	3.6
1	A	255	GLY	3.6
1	B	194	SER	3.5
1	A	177	ASP	3.4
1	A	157	ALA	3.3
1	B	255	GLY	3.2
1	A	227	PRO	3.2
1	A	196	LYS	3.1
1	A	230	SER	3.1
1	B	229	GLU	2.8
1	B	200	PRO	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	199	LEU	2.7
1	A	194	SER	2.6
1	A	254	ALA	2.6
1	A	228	ALA	2.6
1	A	226	PHE	2.5
1	A	224	GLU	2.5
1	A	37	THR	2.5
1	B	63	THR	2.5
1	B	197	ASP	2.4
1	B	49	PRO	2.4
1	B	226	PHE	2.4
1	B	191	ASN	2.3
1	B	86	ALA	2.2
1	A	180	GLN	2.2
1	A	225	ALA	2.2
1	B	198	ILE	2.2
1	A	86	ALA	2.1
1	A	22	ILE	2.1
1	B	202	LEU	2.1
1	A	191	ASN	2.0
1	A	231	LYS	2.0
1	B	157	ALA	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.